Learning From Nature to Build Robots That Can See and Walk

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Abstract

Nature provides many examples of very successful organisms that can "see" the world and "act" in an easy, automatic and energy efficient way. Examples include the fly, which can fly around on a grain of sugar per day, identify and interact with food, mates and avoid swatters. At the top of the evolutionary ladder are humans who, not only navigate in complex environment, but also produce language and complex/original thoughts.

Our work has been focused on understanding various parts of biological sensing, information processing/understanding and acting modules of the Central Nervous System (CNS) of various organisms to build smarter robots and more powerful computers. In this talk, I will describe some of our work on understanding the visual systems of flies and humans, and modeling them using the same chip design technology that is used to realize Pentium microprocessors. Furthermore, I will also describe our study of the spinal cords of lamprey "eels" to understand the neural circuits that allow humans to walk. Eventually, we would like to design bipedal robots that use vision to understand the and intelligently interact with objects in the real world. Our work also has applications in human-machine interfaces and prosthetic devices. The field of study is called biomorphic engineering because it allows us to develop engineered systems based on biological principles.

Short Biographical Sketch

Ralph Etienne-Cummings received his B. Sc. in physics, 1988, from Lincoln University, Pennsylvania. He completed his M.S.E.E. and Ph.D. in Electrical Engineering at the University of Pennsylvania in 1991 and 1994, respectively. Currently, Dr. Etienne-Cummings is an Associate Professor of Electrical and Computer Engineering at The Johns Hopkins University, where he is the Director of Computer Engineering. He is also the Associate Director of Educational and Outreach for the NSF ERC on Computer Integrated Surgical Systems and Technology. Furthermore, he is the Director the Institute of Neuromorphic Engineering, an institute "without-walls" administered out of the University of Maryland, College Park, MD. In addition to serving on various technical committees for IEEE CAS and IEEE SSC societies, he is also a member of IEEE CAS Society Board of Governors. His research interest includes mixed signal VLSI systems, computational sensors, computer vision, neuromorphic engineering, smart structures, mobile robotics and robotics-assisted surgery. He is a recipient of the NSF's Career Development and ONR's YIP Awards.

Admission is free. However, since this event is held within the GSFC security gates, all off-site attendees need to be US Citizens and will need to obtain a temporary badge.
To RSVP, please contact us by phone at 301-286-2893/1893 or by email at LRana@pop600.gsfc.nasa.gov with your full name. The deadline to RSVP for this event will be 5pm on Tuesday, July 26th, 2005

This lecture is held in conjunction with the 2005 NASA Goddard Robotics Internship Program.